3GPP TSG-RAN WG3 Meeting #114-e draft R3-215876

Online, 1 – 11 November 2021

**Agenda item: 19.2.1**

**Source: Nokia (moderator)**

**Title: Summary of offline: positioning accuracy improvements**

**Document for: Discussion and Decision**

# 1 Introduction

This paper summarizes the following email discussion:

**CB: # 1901\_Pos\_Acc\_Imp**

**- Details on exchange of AoA/AoZ:**

**-Inclusion of AoA/ZoA (and related information) in signaling between RAN and LMF**

**- What changes to the agreed BL are needed (if any)?**

**- Other proposals on Positioning Enhancements:**

**- Neighbour information exchange?**

**- TRP Information exchange?**

**- Outdoor/Indoor Indication?**

**- ARP Information exchange?**

**- Converge on Stg3 TP where/if possible**

(Nok - moderator)

Summary of offline disc [R3-215876](file:///C%3A%5CUsers%5Cezlyamo%5CDownloads%5CInbox%5CR3-215876.zip)

# 2 For the Chair’s Notes

[TBD]

# 3 Discussion (Phase 1)

Please provide your Phase 1 views by **14:00 UTC Friday November 5th**, so that they may be taken into account during the online session.

## 3.1 UL AoA: cleanup and open issue resolution

Related proposals from Nokia [1], Huawei [2], CATT [3], and CMCC [4].

A text proposal for NRPPa is provided in [7] addressing the following changes proposed in one or more papers:

1) There is no need to introduce the “ZoA” codepoint in the *TRP Measurement Type* IE [1][2][3][4].

2) The uncertainty range values are mandatory [1][2][4].

3) Remove the FFS for the expected AoA information in the MEASUREMENT UPDATE message [2][3] and make associated corrections to the Measurement Update procedural description and tabular [1].

4) The *LCS to GCS Translation* IE should be changed from mandatory to optional in the *Zenith Angle of Arrival* IE [1].

5) The semantics description of the *LCS to GCS Translation* IE within the *Zenith Angle of Arrival* IE should include “The z-axis of LCS is defined along the linear array axis”, i.e. remove the FFS [2][3].

6) The gNB can inform LMF about the AoA/ZoA uncertainties range in the TRP measurement Result UL AoA IE (9.2.38)

**Question 1: Is the TP in [7] agreeable? If not, which of the above changes (#1-5) requires further discussion?**

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| **Company** | **Comments** |
| Ericsson | 1) Agree2) Agree, otherwise sending the assistance data won’t make sense?3) Although we are fine with the intention and the proposed procedural texts, we believe that, for future-proofing, we should keep the name of the IEs as *TRP Measurement Update List/Item*, as the specification may later evolve to include new information to be sent in the Update message. This avoids creating a list/item for every new information and would make asn.1 easy to update.4) we miss a bit on the justification, but if there is majority view, we can perhaps factorize the IE and use as reference the new IE proposed in **R3-215385** with the semantics.5) OK6) We hope this proposal can be considered, as we had proposed it in our previous paper during last meeting in R3-213851. In our view the gNB can “correct” the AoA assistance information sent by LMF by responding with the values of the AoA/ZoA uncertainty ranges. This can help to enhance the AoA assistance information at LMF when it is for e.g. used in other methods where the window is sent to the UE.9.2.38 UL Angle of ArrivalThis information element contains the uplink Angle of Arrival measurement.

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| **IE/Group Name** | **Presence** | **Range** | **IE Type and Reference** | **Semantics Description** |
| Azimuth Angle of Arrival | M |  | INTEGER(0..3599) | TS 38.133 [16] |
| Zenith Angle of Arrival | O |  | INTEGER(0..1799) | TS 38.133 [16] |
| **LCS to GCS Translation** |  | *0..1* |  | If absent, the azimuth and zenith are provided in GCS. |
| >Alpha | M |  | INTEGER (0..3599) |  |
| >Beta | M |  | INTEGER (0..3599) |  |
| >Gamma | M |  | INTEGER (0..3599) |  |
| Expected Azimuth AoA Uncertainty Range | O |  | INTEGER(0..3599) |  |
| Expected Zenith AoA Uncertainty Range | O |  | INTEGER(0..1799) |  |

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| Moderator Summary: TBD |

## 3.2 Response time

Related proposal from Huawei [2].

For the procedural text for the *Response Time* IE, there is an editor note about whether “shall” or “should” is used. It is proposed in [2] to resolve the editor note as follows:

If the *Response Time* IE is included in the POSITIONING MEASUREMENT REQUEST message, the gNB-DU shall, if supported, send the POSITIONING MEASUREMENT RESPONSE within the indicated time.

**Question 2: Is the above procedural text for the *Response Time* IE (using “shall, if supported”) agreeable?**

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| **Company** | **Comments** |
| Ericsson | This is being discussed in another CB # 1904\_Pos\_LatencyImprovement. We suggest taking it there. |
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| Moderator Summary: TBD |

## 3.3 UL-AoA measurements with ARP

Related proposals from ZTE [5][6].

In the recent RAN1#106bis-e meeting, the following was agreed: “*Association of UL-AoA positioning measurements with gNB ARP is supported in Rel-17*”. The agreement is reflected in the NR higher-layers parameter list [8] and marked as stable (rows 59-60).

An analysis of the RAN3 impacts is provided in [5], and it is proposed to enable reporting ARP (Antenna Reference Point) information with a UL measurement result. Two solution options are described:

**Option #1**: “A TRP should be allowed to provide a list of ARPs in TRP INFORMATION RESPONSE message. The ARP position is defined relative to the associated TRP position. Then, TRP is expected to optionally provide the ARP ID for the TRP measurement result in MEASUREMENT RESPONSE/REPORT message.”

**Option #2**: “A TRP doesn’t have to provide ARP information in TRP INFORMATION RESPONSE message. Instead, the TRP can directly provide the ARP position for the TRP measurement result in MEASUREMENT RESPONSE/REPORT message. Likewise, the ARP position is defined relative to the associated TRP position.”

The two options appear to be functionally equivalent, with main differences highlighted in yellow.

**Proposal 3: Introduce relative position of the ARP to TRP in the *TRP Measurement Result* IE.**

**Question 3: Is the above proposal agreeable? If so, please indicate a preference among solution option #1, option #2, or other (please specify).**

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| **Company** | **Comments** |
| Ericsson | There are some common aspects with the DL AoD LS discussion that also tackles about transmitting antenna information to the LMF over NRPPa. We believe that this can be left to OAM because 1) ARP are static information and 2) any change of antenna status (switching on and off some of the panels) leads to coverage (and connectivity) gaps. Thus the best way is to leave it be set up by OAM at specific hours of the day |
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## 3.4 Other enhancements (unrelated to RAN1 agreements)

Some additional proposals for positioning accuracy improvement are described in [2].

Observation 1: Selecting neighbouring cells based on the coordinates or distance cannot guarantee the selected TRPs are appropriate for positioning.

Observation 2: LMF triggering additional E-CID only for obtaining neighbouring information would cause extra latency for subsequent UL-TDOA or UL-AoA procedures and the E-CID positioning method may not always be supported by the UE.

Observation 3: The neighbouring information can be changing, in which case the neighbouring information from E-CID method would be outdated. It is necessary to let the serving gNB to send the updated neighbouring information

**Proposal 4**: **The serving RAN to provide neighbouring information to LMF to support the LMF selecting measuring TRPs in order to increase the positioning accuracy.**

**Question 4: Please provide your views on the above proposal (e.g., is it agreeable? If not, why?).**

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| **Company** | **Comments** |
| Ericsson | Neighbor info is a superset of the potentially prepared target cells for a handover, which in turn may or may not be a superset of the cell(s) where the UE actually lands after a HO. Transmitting such information to LMF is useless. Over time, the LMF will have all this info anyway.  |
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Observation 4: The TRP information can be collected before a LCS request for a single UE and used for a period of time.

Observation 5: The TRP information is used for all the UEs in multiple cells so that it should be accurate to guarantee the performance, otherwise all those UEs are impacted.

**Proposal 5**: **Support gNB to send the TRP information change notification to the LMF.**

**Question 5: Please provide your views on the above proposal (e.g., is it agreeable? If not, why?).**

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| **Company** | **Comments** |
| Ericsson | Dear Huawei, please note that today we have 65,000 TRPs that can be supported in the NG-RAN. I won’t remind companies that it was also a Huawei proposal to increase this number of TRPs. If every PHY layer parameter has to be dynamically updated to the LMF for all TRPs (plus when there is a CU configuration update), then NRPPa will simply explode! Do you want to kill the protocol??? |
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Observation 6: The A-GNSS positioning method outperforms the RAT-dependent positioning methods in the outdoor scenario while in the indoor scenario the RAT-dependent positioning methods have much better accuracy than the A-GNSS positioning method.

**Proposal 6**: **Let the gNB to provide the outdoor/indoor information along with the cell ID to the LMF; the TRP information exchange procedure can be enhanced to support the outdoor/indoor information exchange.**

**Question 6: Please provide your views on the above proposal (e.g., is it agreeable? If not, why?).**

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| **Company** | **Comments** |
| Ericsson | The LMF knows very well which cells are indoors and which are outdoors, since it is well aware of the network deployment. Nothing is needed. |
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| Moderator Summary: TBD |

# 4 Discussion (Phase 2, if needed)

*Moderator Note: Phase 2 topics (if any) to be decided during online session, e.g. possible TPs for baseline CRs, additional topics for discussion, etc.*

# 5 Conclusions, Recommendations

Capture the following in the Chair’s Notes: [TBD]

# References

1. R3-214977, (TP for NR\_pos\_enh BL CR for TS 38.455) Resolution of open issues for UL AoA (Nokia, Nokia Shanghai Bell)
2. R3-215390, (TP for POS BL CR for TS 38.455, TS 38.473) on positioning enhancement (Huawei)
3. R3-215605, Further Consideration of UL-AOAZOA Assistance Information (CATT)
4. R3-215682, (TP for TS 38.455) Positioning Accuracy Improvements (CMCC)
5. R3-215646, Discussion on supporting UL-AoA positioning measurements with gNB ARP (ZTE Corporation)
6. R3-215648, TP for TS38.455 on supporting UL-AoA positioning measurements with gNB ARP (ZTE Corporation)
7. R3-21xxxx, (TP for TS 38.455) (TP for NR\_pos\_enh BL CR for TS 38.455) Resolution of open issues for UL AoA, (TBD) => draft TP in the Drafts folder
8. R3-215793, LS on Rel-17 LTE and NR higher-layers parameter list (RAN1)